

Remarks

Reconsideration and allowance of all claims are respectfully requested. Claims 1-32 remain pending; including, independent claims 1, 16 & 28.

In the Office Action, claims 1-11, 16-24 & 28-32 were rejected under 35 U.S.C. §103(a) as being unpatentable over Takahashi et al. (U.S. Patent No. 6,182,742; hereinafter Takahashi), while claims 12-15 & 25-27 were rejected under 35 U.S.C. §103(a) as being unpatentable over Takahashi in view of Nakagawa et al. (U.S. Patent Publication No. 2003/0081380; hereinafter Nakagawa). Each of these rejections is respectfully, but most strenuously, traversed and reconsideration thereof is requested.

Applicants request reconsideration and withdrawal of the obviousness rejections on the following grounds: (1) the Office Action fails to state a *prima facie* case of obviousness against the claims at issue based upon a misinterpretation of the teachings of Takahashi applied to the claims at issue; (2) the Takahashi and Nakagawa patents fail to teach or suggest various aspects of Applicants' recited invention; and (3) Takahashi teaches away from Applicants' recited invention.

Failure to State Prima Facie Case of Obviousness Based on Misinterpretation of Takahashi When Applied to Claim Language At Issue:

Independent claims 1, 16 & 28 recite a cooling technique which includes:

- multiple coolant conditioning units (CCUs);
- *each CCU of at least some coolant conditioning units of the multiple coolant conditioning units providing system coolant to a different, associated electronic subsystem of multiple electronic subsystems to be cooled;*
- *each CCU of the at least some CCUs including a heat exchanger, a first cooling loop with a control valve, and second cooling loop, the first cooling loop receiving chilled facility coolant from a source and passing at least a portion thereof via the control valve through the heat exchanger, the second cooling loop providing cooled system coolant to the associated electronic subsystem, and expelling heat in the heat exchanger from the associated electronic subsystem to the chilled facility coolant in the first cooling loop;*

- wherein the control valve allows regulation of facility coolant flow through the heat exchanger, *thereby allowing independent control of a desired temperature of the system coolant in the second cooling loop for cooling the associated electronic subsystem.*

In Applicants' recited invention, there are multiple CCUs, and each CCU provides system coolant to a different, associated electronic subsystem of multiple subsystems to be cooled. The control valve of each CCU allows regulation of facility coolant flow through the heat exchanger, which allows independent control of desired temperature of the system coolant in the second cooling loop for cooling the associated electronic subsystem. Thus, in accordance with Applicants' recited invention, a mechanism is provided for allowing a different system coolant temperature through different, associated electronic subsystems. Applicants respectfully submit that these aspects of their recited invention are not adequately addressed in the Office Action, and as such, the Office Action fails to state *prima facie* obviousness rejections.

More particularly, Takahashi describes a cooling apparatus for use in an electronic system. The cooling apparatus 1100 has two internal cooling control units 1100A & 1100B. Each cooling control unit is of an identical arrangement and provides cooling liquid to a distribution header 1200 for distribution to a plurality of electronic subsystems 100, only one of which is shown in FIG. 1. A tank 1400 receives and temporarily stores warmed cooling liquid returned from the plurality of electronic subsystems 100. This cooling liquid is then returned to the two cooling control units 1100A & 1100B. (See FIG. 1 of Takahashi and column 2, lines 27-44).

In rejecting Applicants' independent claims, the Office Action states, in part:

Each CCU at least some cooling units of the multiple CCUs providing system coolant to a different associated electronic subsystems (FIG. 1, number 100) of multiple electronic subsystems (column 2, lines 34-35) to be cooled ...

This characterization of the teachings of Takahashi is respectfully, but most strenuously, traversed. As is clear from FIG. 1 and the description in Takahashi, plenum 1200 is employed to distribute cooling liquid *to a plurality of electronic systems 100*. Tank 1400 temporarily stores the warmed cooling liquid returned *from the plurality of electronic systems 100*. The multiple cooling control units 1100A & 1100B in Takahashi do not *each* provide system coolant to a

different, associated electronic subsystem. Rather, the cooling control units 1100A & 1100B in Takahashi *both* provide system coolant to multiple electronic systems 100. In view of this, Applicants respectfully submit that the Office Action mischaracterizes Takahashi, and as such, fails to state a *prima facie* case of obviousness against the pending claims.

At page 3 of the Office Action, it is acknowledged that:

Takahashi et al. fails to teach multiple CCUs cooling different electronic subsystems.

This statement at page 3 appears to be contrary to the above-noted citation with respect to Applicants' independent claims contained at page 2 of the Office Action. Because of this inconsistency, Applicants further submit that the Office Action fails to state *prima facie* obviousness rejections.

Page 3 of the Office Action additionally alleges:

While Takahashi et al. teaches only a CCU to cool an associated cooling system, it has been held that duplicating of parts and having a second CCU cooling a second associated electronic system would be held as obvious to one of ordinary skill in the art. *In re Harza* 274 F.2d 669, 124 USPQ 378 (CCPA 1960). It would have been obvious to one skilled in the art to modify the cooling system of Takahashi et al. to have multiple CCUs to cool multiple associated electronic subsystems independently.

For the reasons set forth below, Applicants respectfully, but most strenuously, traverse the above-stated conclusions contained in the Office Action.

Takahashi describes a cooling apparatus 1100 which has two internal cooling control units 1100A & 1100B. Each cooling control unit is of an identical arrangement and provides cooling liquid to a distribution header 1200 for distribution to a plurality of electronic subsystems 100, only one of which is shown in FIG. 1. A tank 1400 receives and temporarily stores warmed cooling liquid returned from the plurality of electronic subsystems 100. This cooling liquid is then returned to the two cooling units 1100A & 1100B. (See FIG. 1 and column 2, lines 27-44 of Takahashi.)

Page 2 of the Office Action equates cooling control unit 1100A with Applicants' recited cooling conditioning unit (CCU). At page 3, it is alleged that mere duplication of parts would be obvious to one of ordinary skill in the art. However, Applicants point out that cooling control unit 1100A is already duplicated in Takahashi as cooling control unit 1100B. Notwithstanding this, Takahashi still teaches that the cooling liquid from the cooling control units 1100A & 1100B is fed to a distribution header 1200 for distribution to *a plurality of electronic subsystems 100*, only one of which is shown in FIG. 1. Further, Takahashi teaches that a tank 1400 receives and temporarily stores the warmed cooling liquid returned *from the plurality of electronic subsystems 100*. Thus, it is not mere duplication of cooling control unit 1100A in Takahashi to arrive at a system such as recited by Applicants in the independent claims presented. Duplicating cooling control unit 1100A, beyond the replicated cooling control unit 1100B, would still result in the cooling control units being coupled to the distribution header 1200 in Takahashi for distribution of coolant to a plurality of electronic subsystems 100.

Since the Office Action does not address this aspect of the teachings of Takahashi, it is respectfully submitted that a *prima facie* case of obviousness is not stated against the independent claims presented. There is no structure in Takahashi which when replicated, results in a system such as recited by Applicants, that is, the existence of multiple cooling conditioning units (CCUs), with *each CCU providing system coolant to a different associated electronics subsystem of multiple electronics subsystems to be cooled*.

Further, Takahashi clearly teaches away from any such system by inclusion of distribution header 1200 and tank 1400 in the cooling apparatus 1100. Each cooling apparatus in Takahashi is designed to cool multiple electronic systems 100. Thus, there is no association of a particular CCU in Takahashi with a particular electronic system, as recited by Applicants.

For at least the above-noted reasons, reconsideration and withdrawal of the obviousness rejections stated in the Office Action are respectfully requested.

Takahashi and Nakagawa Fail to Teach or Suggest Various Aspects of Applicants' Invention:

As noted above, Applicants' independent claims recite multiple coolant conditioning units (CCUs), wherein *each CCU* of at least some coolant conditioning units *provides system coolant to a different, associated electronic subsystem of multiple electronic subsystems to be cooled*. A careful reading of Takahashi and Nakagawa fails to uncover any suggestion of this aspect of Applicants' invention. In Takahashi, the electronic system cooling apparatus 1000 includes two cooling control units 1100A & 1100B, which provide cooling liquid through a distribution header 1200 to the multiple electronic systems. There is no one-to-one correspondence between a cooling unit in Takahashi and an electronic system to be cooled. Based on this, Applicants respectfully submit that there is no teaching or suggestion of their recited invention in Takahashi.

Further, Applicants' independent claims recite that each CCU includes a control valve which allows regulation of facility coolant flow through the heat exchanger. This allows independent control of a desired temperature of the system coolant in the second cooling loop for cooling the associated electronic subsystem. No such control is available with the teachings of Takahashi since a common distribution header and common tank are employed. For this additional reason, reconsideration and withdrawal of the anticipation rejection to the independent claims is respectfully requested.

Takahashi Teaches Away From Applicants' Recited Invention:

The Office Action alleges mere duplication of the internal cooling control unit 1100A to arrive at Applicants' recited invention. However, this assertion ignores the clear teaching of Takahashi of distribution header 1200 and tank 1400 for distributing coolant to multiple electronic systems 100. Based on this teaching, Applicants respectfully submit that one of ordinary skill in the art would not have modified Takahashi as proposed in the Office Action. Takahashi clearly teaches providing coolant fluid to multiple electronic subsystems 100 using distribution header 1200 and tank 1400. If one were to modify Takahashi as proposed in the Office Action, the distribution header, and multiple lines in the tank 1400 would have no purpose. Thus, the Office Action's assertion is believed contrary to the express teachings of Takahashi.

For this additional reason, Applicants respectfully request reconsideration and withdrawal of the obviousness rejection to the claims presented.

Dependent Claims:

The dependent claims are believed allowable for the same reasons noted above with respect to the independent claims, as well as for their own additional characterizations.

For example, claims 6, 19 & 29 recite that the multiple CCUs include multiple CCU pairs. *Each CCU pair* including a dedicated CCU and a redundant dedicated CCU *for cooling a different, associated electronic subsystem of the multiple electronic subsystems*. Although the language of Applicants' claims is repeated in the Office Action, there is no recognition that Applicants are reciting that each CCU pair cools a different, associated electronics subsystem of the multiple electronic subsystems. In Takahashi, the two cooling control units share a distribution header and a warmed liquid return tank in cooling a plurality of electronic systems 100. In contrast, Applicants' recite a cooling system configuration wherein there are multiple CCU pairs, with each CCU pair having a dedicated CCU and a redundant CCU, and each pair cooling a different, associated electronic subsystem. Claims 9 & 22 recite the subject matter of claims 6 & 19 noted above, and further set forth redundant facility coolant supply lines and redundant facility coolant return lines, wherein chilled facility coolant can be automatically switched from one supply line to another supply line or from one return line to another return line upon detection of a failure in any one of the lines. In contrast, Takahashi teaches a single coolant supply line and single coolant return line for the two cooling control units 1100A & 1100B.

Claims 11 & 24 recite that each CCU further includes a reservoir in series with the second cooling loop for ensuring an adequate supply of system coolant flow through the second cooling loop. In Applicants' system, each coolant conditioning unit of the multiple coolant conditioning units has a reservoir in series with the second cooling loop. In contrast, Takahashi teaches a reservoir 1400 that is shared by the two cooling control units in series with the second cooling loops thereof. Clearly this is a different structure than that recited by Applicants in the claims at issue.

With respect to dependent claims 3 & 18, Applicants recite that the common source of chilled facility coolant includes at least two source input lines and at least two source return lines. Each input line and each return line services at least two CCUs of the multiple CCUs. Again, the respective independent claims recite that each CCU provides system coolant to a different, associated electronic subsystem. Since the cooling control units of Takahashi together provide cooling liquid to multiple electronic systems through the distribution header and common return tank, no similar configuration to that recited by Applicants in these claims is presented. Applicants respectfully submit that it is not a simple matter of duplicating the chilled facility source input and return lines of Takahashi to ensure redundancy since the coolant conditioning units each provide system coolant to a different, associated electronic subsystem.

With respect to dependent claims 12-15 & 25-27, Applicants respectfully submit that Nakagawa does not teach or suggest the above-noted deficiencies of Takahashi when applied against the respective independent claims. Again, these claims need to be interpreted in light of the above-noted differences of the independent claims relative to the Takahashi patent. Even if one were to accept the combination of Nakagawa with Takahashi as proposed in the Office Action, the resultant cooling system still would not teach or suggest Applicants' recited invention. Notwithstanding this, Applicants respectfully traverse the applicability of Nakagawa to the claims at issue.

In Nakagawa, a liquid cooling system for a notebook computer is presented, wherein a single cooling loop is shown in FIG. 10 along with a reserve tank which includes replenishment liquid that is fed into the single cooling loop through a check valve. In contrast, Applicants' claims at issue recite an external system coolant reservoir which is shared by at least two CCUs of the at least some CCUs. Claims 15 & 27 further recite that each second cooling loop of the at least two CCUs is coupled to the common supply line via an upwardly extending branch line which continues to hold system coolant notwithstanding removal of system coolant from the common supply line. Again, this language is in combination with the at least two CCUs recited in the independent claims and the external coolant reservoir shared by the at least two CCUs.

Advantageously, Applicants provide herein a cooling system configuration wherein failure of one CCU, for example, through damage to a system loop thereof, will only effect the associated electronic subsystem, and not the remaining electronic subsystems of the multiple electronic subsystems to be cooled. No such facility is provided by a combination of Nakagawa and Takahashi. There is no isolation of CCUs in Takahashi, and as such, damage to a cooling liquid supply line thereof will cause the entire cooling system to fail, resulting in a cessation of cooling to the multiple electronic systems.

For at least this additional reason, reconsideration and withdrawal of the rejection to claims 15 & 27 is requested.

Additionally, Applicants respectfully submit that the Office Action fails to state a *prima facie* case of obviousness against dependent claims 14 & 26. The Office Action alleges that it would have been obvious to one of ordinary skill in the art at the time the invention was made to duplicate the chilled facility coolant source input lines. *However, simple duplication of chilled facility coolant source input lines is not being recited in the claims, and in fact, is not relevant to the language at issue.* In Applicants' recited invention, a different supply line connects the external system coolant reservoir to the *second cooling loop of each CCU* of the at least some CCUs. Thus, the discussion in the Office Action regarding duplicating the chilled *facility coolant source input lines* is not believed relevant to the recited invention, and as such, Applicants respectfully submit that a *prima facie* case of obviousness is not stated.

For at least the above-noted reasons, Applicants request reconsideration and withdrawal of the obviousness rejections set forth in the Office Action.

All claims are believed to be in condition for allowance and such action is respectfully requested.

If a telephone conference would be of assistance in advancing prosecution of the subject application, Applicants' undersigned attorney invites the Examiner to telephone him at the number provided.

Respectfully submitted,



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